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plasma of a mixed gas containing  $\text{NF}_3$  and Ar through an opening patterned in said second insulating material layer in said third step.

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4. The method for fabricating semiconductor devices according to claim 3, wherein said etching process is performed by setting the bias electric power per unit sample area applied to the sample to below  $0.16\text{W}/\text{cm}^2$ .

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5. The method for fabricating semiconductor devices according to claim 3 or 4, wherein said etching process is performed by setting the processing plasma pressure to below  $0.5\text{Pa}$ .

6. The method for fabricating semiconductor devices according to any one of claims 3 to 5, further comprising, immediately after said etching process, a process for subjecting to said sample an  $\text{O}_2$  or  $\text{H}_2$  plasma processing.

7. A plasma etching processing apparatus comprising: a sample table for placing a sample provided in a reduced pressure processing chamber; gas introduction means for introducing a processing gas into said reduced pressure processing chamber; exhaust means for exhausting said processing gas out of said reduced pressure processing chamber; and means for generating plasma of said introduced processing gas in said reduced pressure processing chamber, further comprising: magnetic field apply means for applying a magnetic field to said sample provided on the back

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surface of said sample; and voltage apply means for ON-OFF applying to said sample a negative DC voltage in which the OFF period of the ON-OFF application is below  $10^{-6}$  seconds.

- 5 8. A dry etching method comprising using the plasma etching processing apparatus according to claim 7 to etch an insulating film deposited on a copper layer provided on a sample under the conditions of said negative DC voltage of below 200V.
- 10 9. An apparatus for fabricating semiconductor devices comprising a sputtering processing chamber for depositing a metal film on a semiconductor sample by a sputtering method; and an etching processing chamber for etching an insulating film on the semiconductor
- 15 sample by a dry etching method, further comprising: a plasma processing chamber for performing a plasma processing of the semiconductor sample; and exhaust gas processing equipment capable of subjecting both combustible gas and combustion buck up gas to an
- 20 exhaust gas process.
- 25 10. The apparatus for fabricating semiconductor devices according to claim 9, further comprising gas introduction means for introducing at least three gases of  $\text{NF}_3$ ,  $\text{H}_2$ , and  $\text{O}_2$  into said etching processing chamber.